Be Well Aware

Checklist

- new wells are properly constructed and located a safe distance from contaminants
- existing wells are properly inspected, maintained, and upgraded as necessary
- potential contaminants are kept a safe distance from your well
- well water is regularly tested for bacteria, and is screened initially and periodically for other contaminants
- unused wells are properly plugged and sealed

Take care of your well and your groundwater – for the sake of your family, your neighbours, and future generations.

SUPPORTED BY: Conservation Corps Newfoundland and Labrador, Environment Canada's Eco-Action Program, Newfoundland and Labrador Department of Environment and Conservation, and Department of Health and Community Services, Green Communities Canada, Climate Change Education Centre, Newfoundland and Labrador Water Well Association

Conservation Corps Newfoundland & Labrador

Environment Canada

Environnement Canada

Green Communities Canada

Government of Newfoundland and Labrador

by the Conservation Corps Newfoundland and Labrador in partnership with Green Communities Canada. Financial support provided by Environment Canada's Eco-Action Program and the Newfoundland and Labrador Department of Environment and Conservation.

Well Aware

A guide to caring for your well and protecting your family's health.

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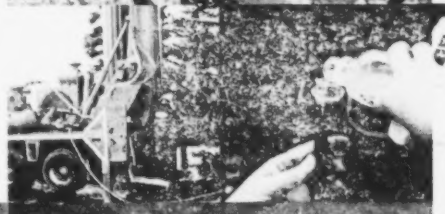

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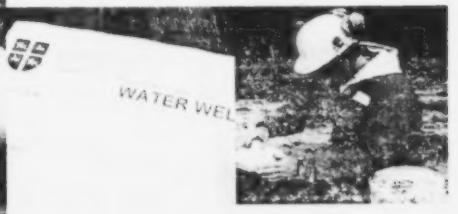

Well Aware

Conservation Corps Newfoundland & Labrador

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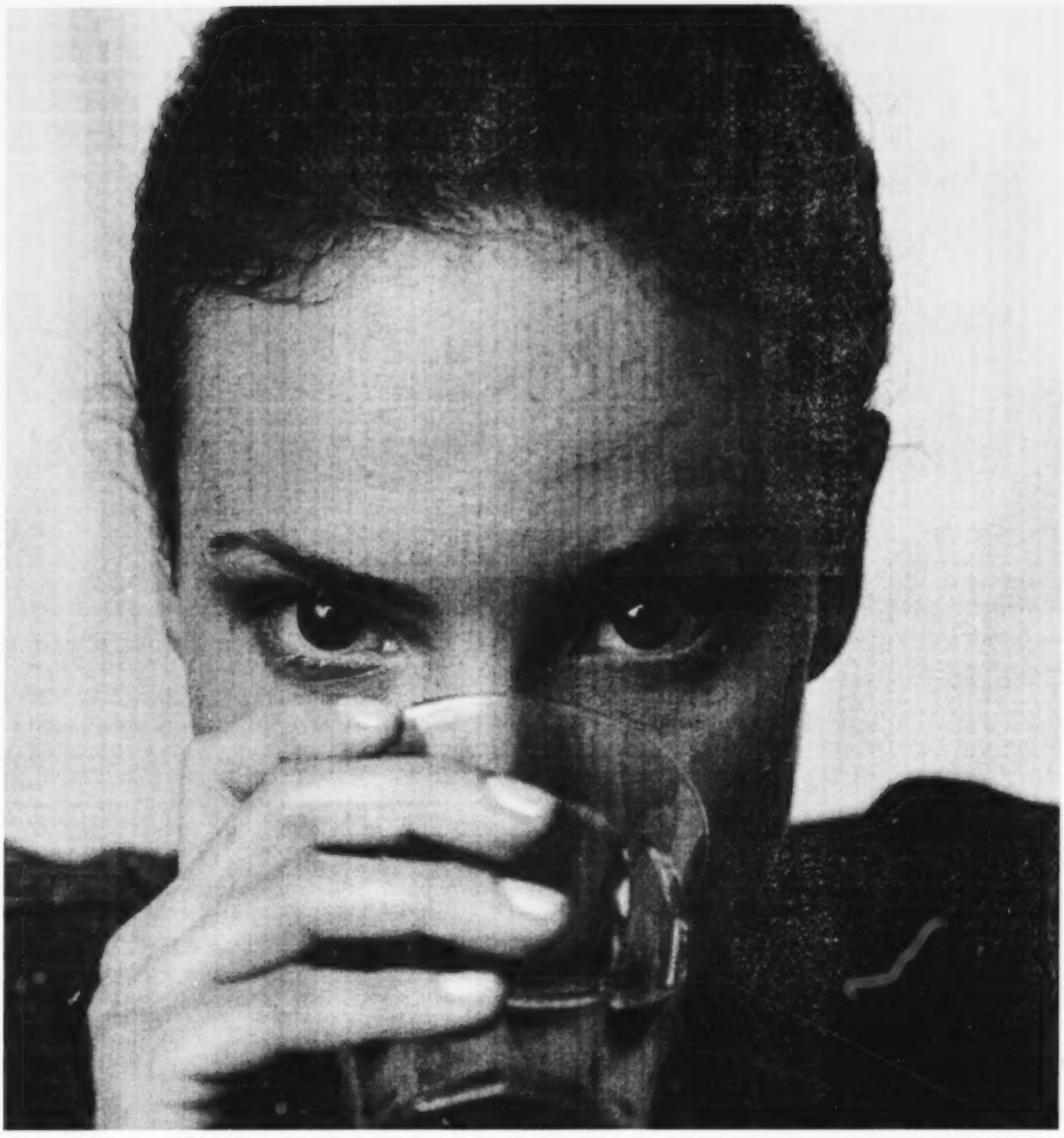


Acronym List:

DOEC - Department of Environment and Conservation
EHO - Environmental Health Officer
GHG - Greenhouse Gas
NSF - National Sanitation Foundation

Be *well aware*

Your family's health *depends* on it!

Your well taps into one of nature's treasures – cool, clean groundwater.

You and your family depend on this precious resource every day for cooking, washing, and a continuous supply of safe drinking water.

About this booklet

As a private water well owner, it is your job to be well aware — to understand the basics of well maintenance and operation, and to take the necessary actions to keep your water well in safe running order. This booklet is a guide to caring for your well and protecting the groundwater in Newfoundland and Labrador.

To improve your working knowledge of wells and the well life cycle, read the sections on groundwater, well type, well location, construction, upgrading, and proper plugging and sealing of unused wells.

For an outline of your ongoing responsibilities as a well owner, read the sections on well maintenance, including well water protection, pollution prevention and water conservation. An inspection and maintenance routine is recommended for every well on your property.

For a better understanding of well water quality issues and what to do about them, read the sections on groundwater basics, potential water contaminants, testing, remedies, and treatment systems.

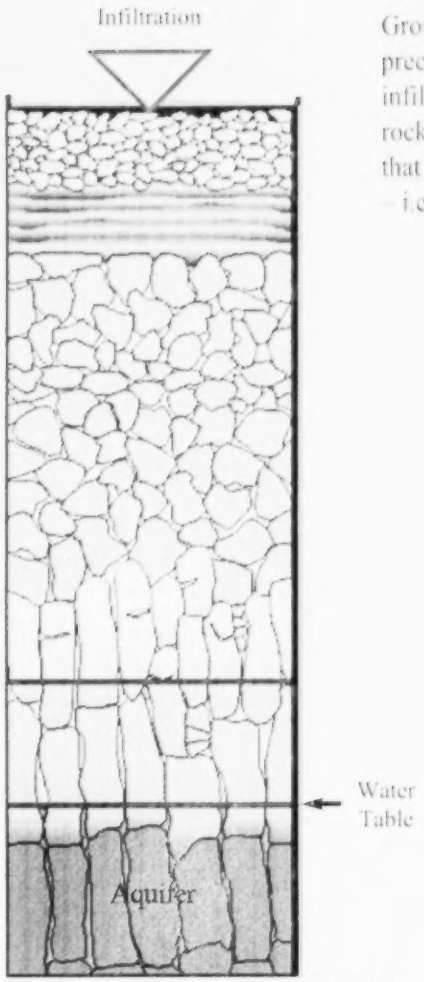
The back of the booklet includes information about hiring well drillers and using your well record. Further resources and contacts are listed. Handy diaries for water testing and well maintenance are included.

It's the law. Well Drilling Regulations, under the Water Resources Act and the Sanitation Regulations under the Health and Community Services Act, set out your obligations as a well owner in Newfoundland and Labrador.

Groundwater basics

Your well gets its water from an underground water source called groundwater.

Groundwater originates from surface water and precipitation, including rain and melting snow, that has infiltrated the earth, filling the cracks and open spaces in the rocks and the soil. Saturated layers below the water table that store and transmit significant quantities of groundwater – i.e., enough to supply a well – are called aquifers.



Saturated layers below the water table that transmit significant quantities of groundwater are called aquifers. Credit: *BMP2 Water Wells*

Keeping it clean

Surface spills of contaminants like fuel can infiltrate the soil and contaminate groundwater. The risk of contamination is greatest where the ground surface is highly water permeable, e.g., in areas with coarse soils or fractured bedrock at or near the surface.

Groundwater can also be contaminated by underground sources, such as leaking fuel storage tanks or malfunctioning septic systems. Poorly constructed or deteriorating wells can act as a direct pipeline for surface pollutants to contaminate the aquifer. Unused and unmaintained wells are a special concern if they haven't been safely plugged and sealed.

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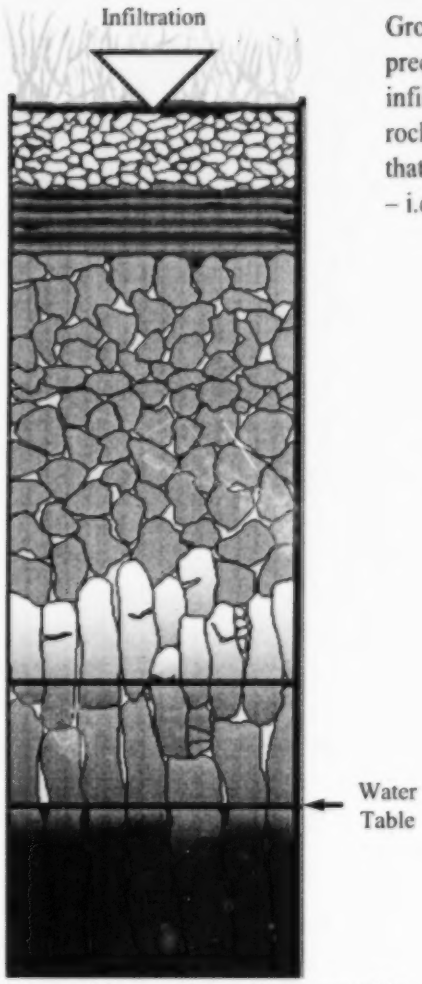

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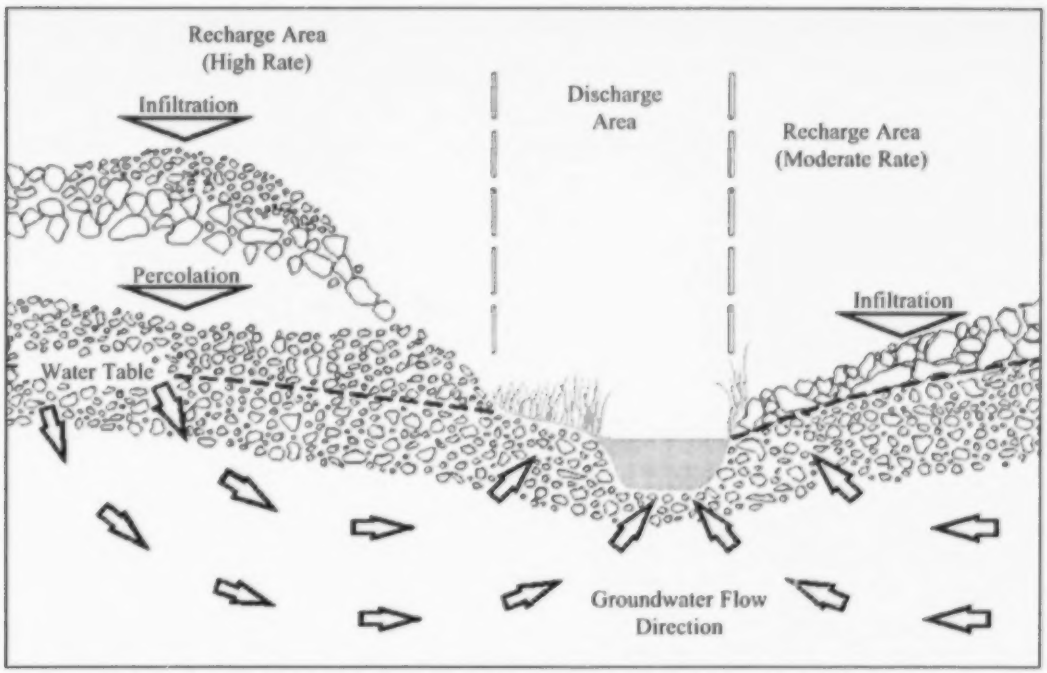
Groundwater belongs to all of us. It's a shared resource that we all enjoy and have a duty to protect.



Compared to surface water, groundwater usually moves very slowly – from a few millimetres to a few metres a day. Groundwater affects the quality and quantity of surface water where it discharges into streams, rivers, wetlands, and lakes. Credit: ***BMP: Water Wells***

Groundwater ***flows***

It is impossible to determine the exact direction of groundwater flow based on surface features alone. However, we know that water in the aquifer near a pumping well will flow toward the well.

The danger of groundwater contamination is greatest when the contaminant source is close to your well. However, on rare occasions contaminants have been known to spread over several kilometres.

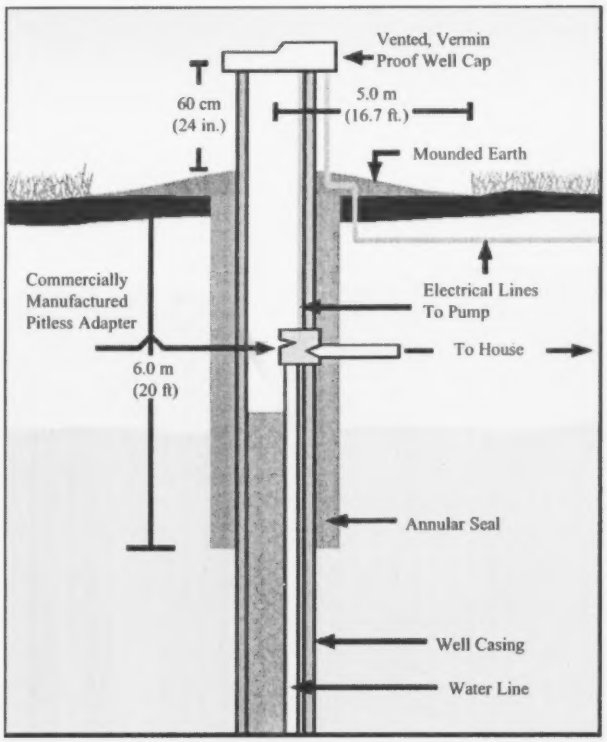
Well *type*

Drilled Wells

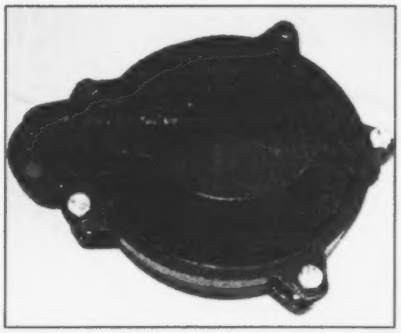
Drilled wells obtain water from deep groundwater aquifers.

Drilled wells are typically about 45 m (150 ft) deep and have a diameter of 15 cm (6 in).

There are two main types of wells found in Newfoundland and Labrador; dug, or shallow wells, and drilled wells.



Distances in illustration are minimums. Credit: ***BMP: Water Wells***

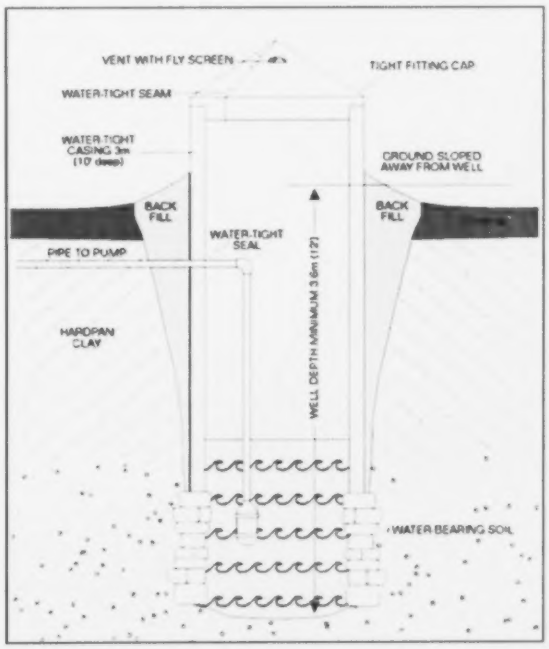


Vermin-proof well cap.

The Water Resources Act states all drilled wells must be constructed by a provincially licensed well driller.

Dug Wells

Dug wells are at higher risk of contamination than drilled wells because they obtain water from shallow groundwater aquifers. Contaminants are more likely to be found closer to the surface (see Protecting Your Well Water, p.13). If you own a dug well, be sure to test it often and consider replacing it with a drilled well if your water supply is not adequate or safe.



Shallow wells are at a higher risk of contamination than drilled wells.

Dug wells are typically 3.7m - 7.6m (12-25 ft) deep and have a diameter of about 1 m (3.3 ft)

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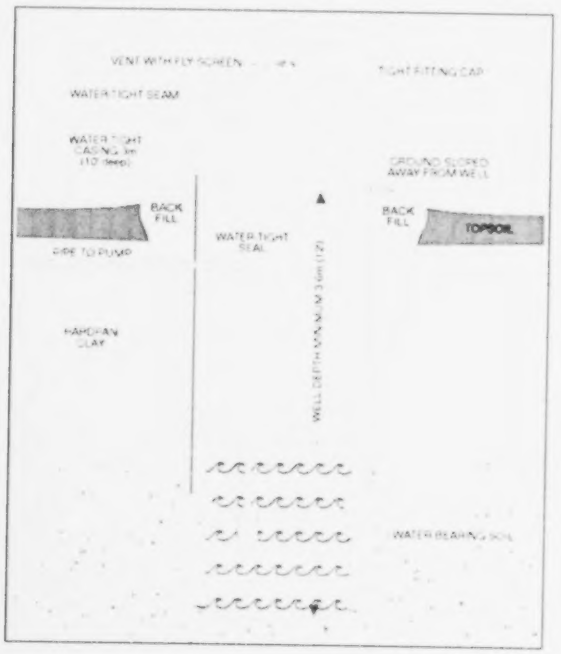

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Locating *a new well*

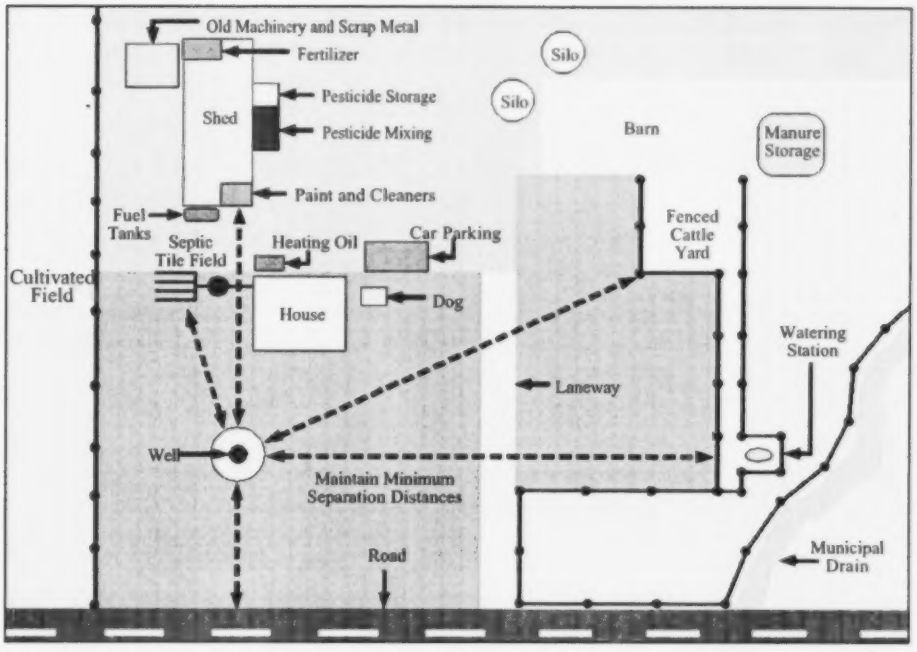
If you are constructing a new well, think carefully about the best location, that is, a high point of land with good access and separation from potential contaminants. Contact a Department of Environment and Conservation licensed well driller to locate a drilled well on your property. Contact a Government Services Centre approved designer for dug well construction information.

The ground must slope *away from the well*

Locate your well on a higher point of land so that run-off and contaminants drain away from the well rather than toward it. The area nearby can be landscaped and contoured to help direct run-off away from the well.

Access

Wells and well-related equipment must be sited so they can be easily accessed at all times for cleaning, treatment, repair, testing, and visual examination. During the winter months, remember to clear snow from the area surrounding your well.



Verify adequate separation from potential contaminants. Credit: ***BMP: Water Wells***

Separation from contaminants

Wells must be located a safe distance from potential sources of contamination such as fuel storage tanks, stockpiles of chemicals like pesticides or road salt, septic systems, gardens, manure piles, livestock, and roads and driveways.

The following tables show ***minimum*** required distances between wells and possible contaminants:

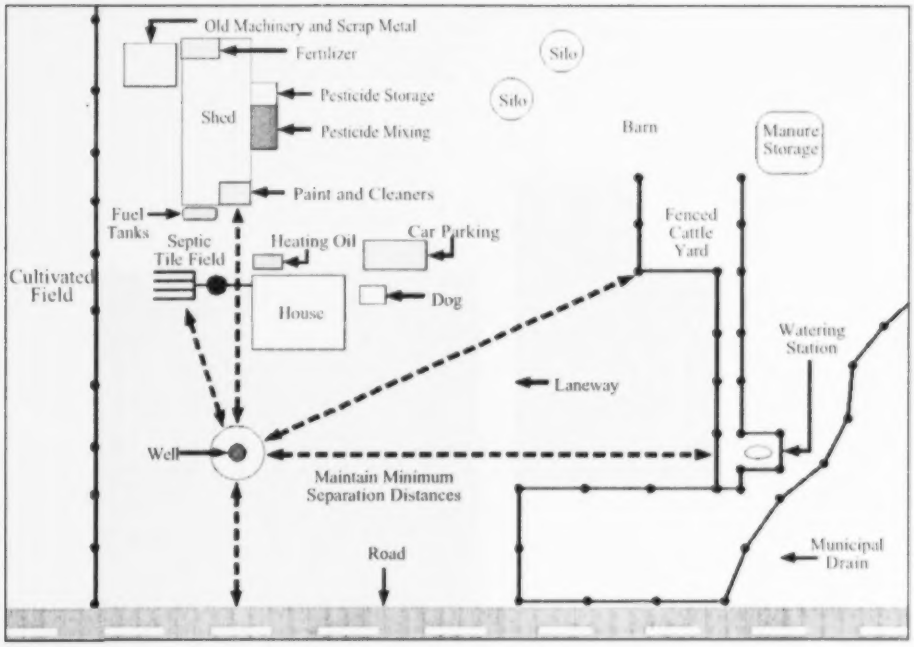
Drilled wells:

- 15 m from septic tank systems
- 30 m from cesspools of sewage
- 1 m from pumphouse floor drains
- 2 m from buildings
- 75 m from manure spreadings on agriculture fields

Dug wells:

- 15 m from septic tanks
- 30 m from septic fields
- 30 m from all other potential contaminants
- 75 m from manure spreadings on agriculture fields

These minimum distances do not guarantee safety. Increase the separation wherever possible, and eliminate sources of contamination.



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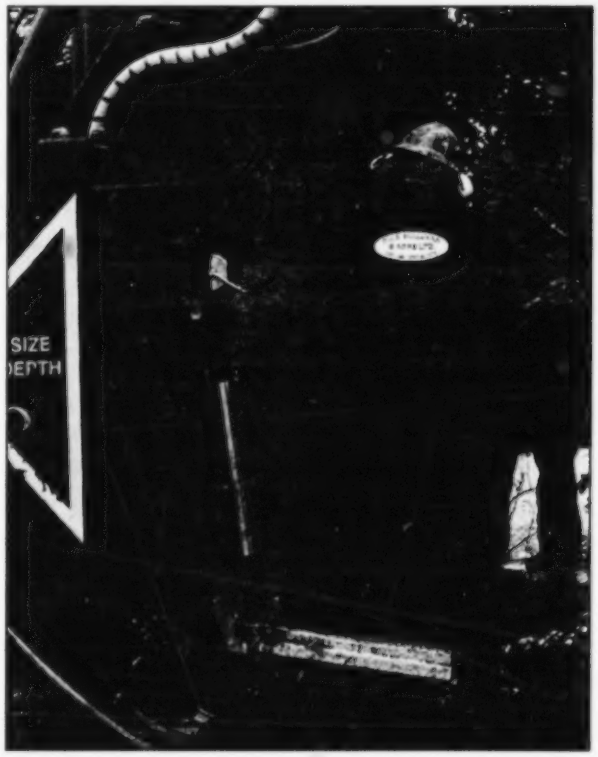
Well construction

A properly constructed well forms an effective barrier against surface run-off that may enter and contaminate the well.

Water must infiltrate and pass downward through the soil and/or rock before it can reach the aquifer from which your well gets its water.

Over the years, well design has improved to reflect advances in technology and our understanding of potential pathways of contamination. The Well Drilling Regulations, under the Water Resources Act, outlines minimum construction requirements for drilled wells. Always hire a well driller licensed by the Department of Environment and Conservation who is familiar with these regulations.

Dug wells must be designed in consultation with an Environmental Health Officer (EHO). It is difficult to make a dug well as safe as a drilled well.



Well casing

New wells should be lined with a watertight casing designed to prevent the walls of the well from collapsing. Well casings must be of sufficient length to keep contaminants out of the well water. Steel casings are typically used, but casings can also be made from plastic.

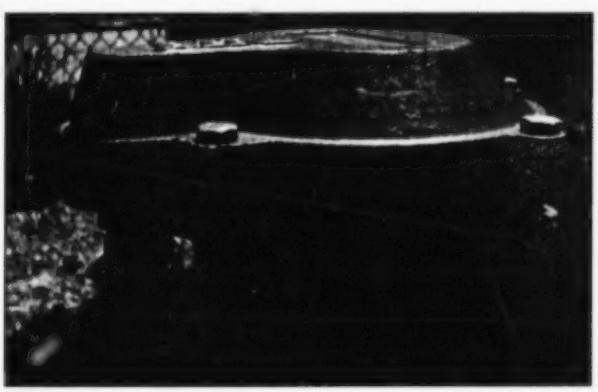
The annular seal

When your well is drilled the hole in the ground is bigger than the well casing. The resulting gap – the annular space – must be filled with a watertight sealant such as bentonite that does not shrink or crack under the ground. For maximum protection, the sealant should extend the full length of the casing.

The annular seal serves as a barrier to run-off, surface water, and near-surface waters that could otherwise travel down the outside of the casing and contaminate the aquifer.

Well cap

Your drilled well must be capped with a commercially manufactured vermin-proof well cap. Vermin-proof caps have rubber gaskets and screened vents inside to prevent entry of "foreign material" such as vermin, insects, and decaying plant material. Loose fitting caps found on older wells make these wells a comfortable home for insects and vermin.



Upgrading *your well*

It is possible – even likely – that your existing well does not meet the new construction standards described in the preceding section. What should you do?

Consider upgrading your existing well for the sake of your family's health and safety and the security of your drinking water source.

Talk over your options with a DOEC licensed well driller or EHO who is experienced with upgrades and familiar with conditions in your area.

Faulty annular seal.

Upgrade your well, or construct a new one?

If there are water quality problems with your existing well, one option is to drill a new well.
A new well may be the best way to go if your existing well is:

- badly located, close to permanent sources of contamination, or at risk from flooding
- not producing adequate water supplies
- substandard and cannot be upgraded for technical or regulatory reasons

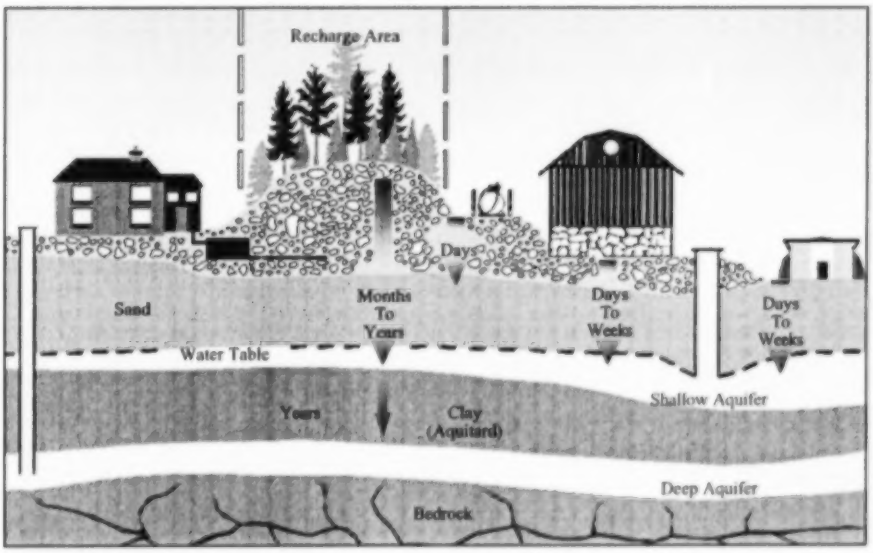
Do you have a ***high risk*** well?

Some wells are at higher risk of contamination and require extra care and attention. Consider the following factors:

- shallow, or dug, wells, less than 6 metres (20 feet) deep, are at higher risk than deeper, or drilled, wells because the water table is closer to the surface and can be contaminated more easily;
- older wells are at higher risk than newer wells because of casing deterioration and older, less advanced, well construction methods.

Another important risk factor is the type of soil and/or rock between ground surface and the aquifer from which your well draws its water. Put simply, your well is at lower risk if these materials effectively stop surface contaminants from reaching the aquifer; it is at higher risk if contaminants can infiltrate more rapidly.

For example, coarse soils like sand and gravel are a less effective barrier than thick deposits of fine soils like clay loams or silty clay. If your well ends in bedrock, which is likely in Newfoundland and Labrador, it is at higher risk if bedrock fractures extend to ground surface or near the surface.



Water infiltrating from the surface may reach a shallow aquifer in days to weeks. It could take years to reach a confined deeper aquifer.
Credit: ***BMP: Water Wells***

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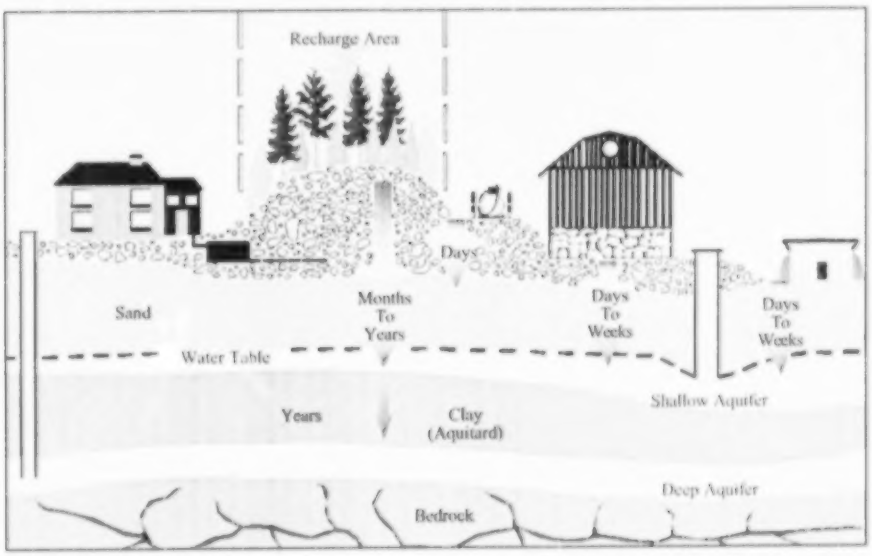

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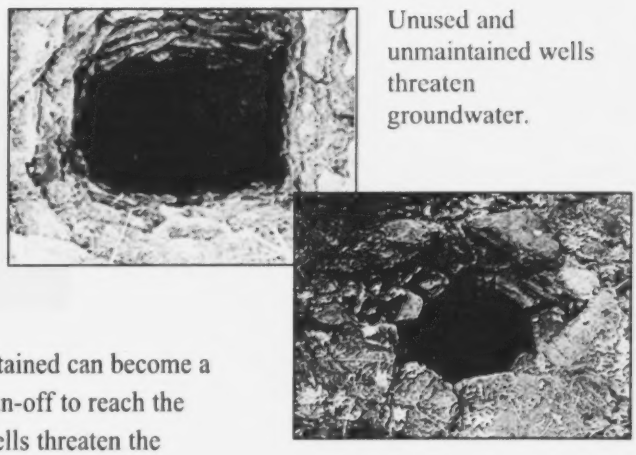
Plugging *and* sealing



Unused and unmaintained wells threaten groundwater.

An unused and unmaintained well that hasn't been properly plugged and sealed poses health and safety hazards for animals and humans, especially children.

A well that is no longer used or maintained can become a direct pipeline for surface water or run-off to reach the aquifer. Unused and unmaintained wells threaten the groundwater that supplies your well, and possibly your neighbours' wells.

It is your responsibility under the Well Drilling Regulations to ensure that your unused wells are properly plugged and sealed.

Don't try to seal your own well – it is not as easy as it seems. If you simply fill up your unused well with sand, gravel, stones, debris, or garbage, you won't prevent the flow of surface water or run-off into the well. The material in the unused well may even contribute to contamination of your groundwater source.

If an unused and unmaintained well is on your property, you are legally responsible for ensuring that it is plugged and sealed properly.

Hire a DOEC licensed well driller who has the expertise and equipment to do the job properly. Newfoundland and Labrador has guidelines for sealing drilled groundwater wells that require filling the well with alternating layers of bentonite clay and sand or local soil. Dug wells can be filled in with clean, local soil and any exposed well liner should be removed.

Protecting your *well water*

As a responsible well owner, you need to carry out a regular program of well maintenance. Taking care of your well is a three-step process:

1. protect your well water at the ground surface by avoiding, eliminating, or reducing contaminants
2. inspect your well regularly and keep your well in good running order
3. test your well water regularly and respond to contamination problems

The following sections of this booklet will show you how.

The protection of source waters is the first step in protecting your well water. Source protection is often the most cost-effective way to keep contaminants out of drinking water. And it is almost always less expensive to keep water clean than to try to deal with the consequences of contamination.

Well water protection *starts at home*

The most immediate threats to the safety of your well water are usually nearby – in your own yard.

As part of your routine well maintenance schedule, walk the grounds surrounding your well. Look for potential threats. A complete search for potential contaminants is recommended, at the same time as you inspect your well (see pages 21-22). You should also look for changes that could affect your well as part of your daily and weekly routines.

Keep these contaminants away from your well:

- pet and livestock wastes
- gasoline, diesel, home-heating fuels
- pesticides and fertilizers (chemical or natural)
- other hazardous chemicals, including paint, solvents, barbecue starter fluid, etc.
- de-icers (used to melt ice on roads, driveways, sidewalks)
- and any other substance you don't want in your family's drinking water.

Never hose down spills.

Chemicals *and fuels*

Any chemical or fuel spills that infiltrate the ground can contaminate your drinking water source. Check that gasoline, pesticides, and other chemicals are stored in proper containers designed to help prevent spills or leakage. Don't store these materials anywhere near your well.

- Refuel lawn mowers and other machinery a safe distance from the well. (One litre of gasoline can contaminate 1 million litres of groundwater.) Refuel over hard surfaces to help prevent infiltration of spills.
- Change the oil in your vehicle on a sealed surface such as pavement or concrete away from the well.
- Clean up spills with an absorbent material, such as clean sand or kitty litter. Keep a bucket nearby for quick access when spills occur. Material used to clean up spills should be disposed of properly. Contact your local municipality for Household Hazardous Waste Days in your area.

Fuel and chemical leaks and spills can pollute groundwater.

Septic systems

Locate your septic system down grade and away from your well. Ensure that your system conforms with the Sanitation Regulations under the Health and Community Services Act. Keep chemicals other than human waste out of the system. Pump out your septic tank every two to three years, or ask your pumper to specify the appropriate pump-out frequency. Keep your system in good running order by conserving water (see pages 19-20).

Gardens

Eliminate gardens adjacent to your well. Plant a permanent low-growing ground cover such as grass. Don't use fertilizers or pesticides.

Underground *storage tanks*

Underground storage tanks and associated pipes and fittings, particularly valves, may leak, especially if they are over 15 years old or lack corrosion protection. Underground storage tanks are a special concern if the water table is shallow, or if the tank is close to your well (or surface water). If possible, replace underground tanks with above ground storage that has proper spill/leak containment.

Underground heating oil storage tanks with only one wall will not be permitted in Newfoundland and Labrador after March 31, 2007.

Above-ground *storage tanks*

If storage tanks are required, keep them as far as possible from your well. Install sheltered tanks with spill containment, as required by regulation, capable of holding 125 per cent of the volume of the tank. Security and protection from damage are advisable.

In Newfoundland and Labrador, heating oil tank owners must register their tanks on or before March 31, 2007. For registration procedures, contact your heating oil supplier or heating service contractor.

Abandoned *tanks*

Look for evidence of abandoned tanks that pre-date your ownership, including pipes sticking out of the ground. An abandoned tank may still contain harmful liquids that will leak as the tank corrodes.

Animal *wastes*

Livestock and pet wastes are a serious potential threat to well water, as the Walkerton, Ontario tragedy showed. Keep livestock and pets away from your well at all times.

Newfoundland and Labrador has about 290 public groundwater sources providing water to an estimated 54,000 residents.

Source protection – *the bigger picture*

Contaminant sources affecting your well are most often found in your own backyard. Address these first. However, you should also support actions to protect all sources of drinking water for your community.

Municipal land-use plans need to identify vulnerable ground and surface waters. Land-use plans should provide the necessary protection through controls on the location, amount, and type of development.

Major sources of contamination need to be curbed, like polluting industries and urban and agricultural run-off.

Programs need to be in place to reduce risks of groundwater contamination from unused wells, open excavations, quarries, and contaminated sites.

Get involved in protecting sources of drinking water for your community. Contact your municipality for information.

Inspecting *your well*

It is the well owner's responsibility to maintain their well - to keep out surface run-off and foreign materials.

It is recommended that you conduct an inspection of your well at least once a year, as outlined below, at the same time as you check for potential contaminants (see page 13).

If you've got problems with your well water, or concerns about your well, have your well inspected by a DOEC licensed well driller.

Access

As part of your maintenance routine, keep your well clear of brush, debris, snow and other obstructions.

Well *cap*

Check the well cap for signs of cracking or damage, and get it fixed or replaced immediately if there is a problem. The well cap should be firmly attached to the casing. The vent should face the ground and be properly screened to keep out insects. Only air should enter. The well cap should be above ground and exposed at all times; cleared from snow, leaves and other obstacles.

Annular *seal*

Look for problems with the sealant used to fill the annular space between the drilled hole and the well casing. A depression in the ground around the edge of the casing can indicate that the sealant has shrunk, collapsed, or cracked. If you can move the casing around by pushing it, that's a bad sign. Cracking and gaps allow run-off and surface water to move down the outside of the well casing and contaminate your drinking water. A faulty annular seal needs to be repaired. Call a DOEC licensed driller.

Well *casing*

Look for any external signs of damage, cracking, or dislocation of your well casing, e.g., due to vehicle damage. If you've got a small diameter well (drilled), removing the cap is not recommended. Visibility is limited and you could cause contamination or damage, especially if you have a submersible pump. Some licensed well drillers can inspect your casing with a down-hole camera. If you've got a larger diameter dug well, you can remove the lid with care. Inspect the inside casing using a strong flashlight. Look for holes or cracks, including evidence of animal infestations, or stains coming from the casing joints.

Backflow *prevention*

Under certain circumstances, contaminated water can flow backwards through your plumbing into your well. Backflow prevention devices are available from your licensed well driller or pump installer.

Well water *conservation*

Why Conserve?

Water heating accounts for 11.1% of your personal greenhouse gas emissions (GHG).

Avoid Water Shortages!

Many well owners have experienced their well going dry at one time or another. Help prevent water shortages by using water wisely.

Help Your Septic System!

Too much water flowing through the septic system can cause problems and lower the life expectancy of your system. One study conducted found that overuse of water caused 75% of septic bed failures.

Conserve Energy and Save $$$!

Using less water means less energy is required for pumping, heating and treating your water. Making small changes can make a big difference in your energy bill. Replace your regular showerhead with a low flow version and save 25% of shower water annually, that's cash in your pocket!

Be Kind to Mother Nature

By conserving water, you will be aiding Canada in its effort to protect our precious groundwater resource as well as reduce greenhouse gas emissions. About 29% of this Province's population relies on groundwater. It is essential that we help protect this valuable water supply by properly maintaining and protecting our wells.

One-Tonne CHALLENGE

The average Canadian produces five tonnes of GHG a year. Check out the One Tonne Challenge at www.climatechange.gc.ca for information on how you can help reduce your GHGs.

Tips to help you *conserve*:

Use Water-Saving Devices

- Use up to 50% less water in your toilet by using an ultra low-flush 6-litre version. Dual-flush toilets can save 68% of water used by supplying separate flushing mechanisms for liquid and solid waste.
- When replacing your clothes washer, consider a front loading washer - they use 40% less water than top loading washers.
- Attach aerators to all your taps to reduce water consumption by 25%.

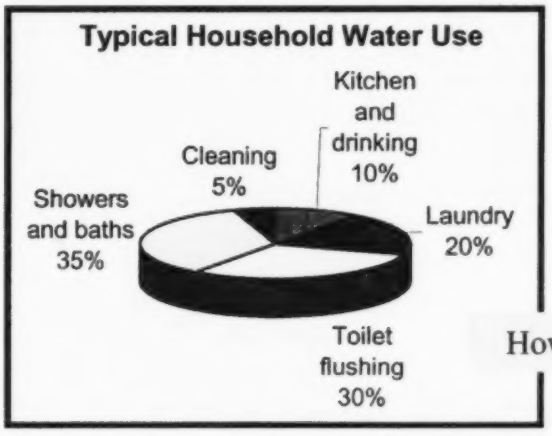
Repair Leaks Quickly

- Leaks can waste thousands of litres of water if they are not repaired right away. Leaking water costs money to treat and heat and places wear and tear on your water system. That's money down the drain.

A leak of one drop per second will waste 10,220 litres per year!

Use Water Wisely

- Never let water run continuously while washing dishes or brushing teeth.
- Collect rainwater and use it to water your garden. If you must use a water hose, use a shut-off nozzle to prevent wasting water.



How can *you* reduce?

Possible ***contaminants***

What could be wrong ***with my*** water?

Drinking contaminated well water can make you and your family members ill. It can even be fatal, especially for the young and the elderly.

Even though your water may appear to be fine, there are many possible contaminants that you can't taste, see, or smell. Here are a few possible contaminants:

Total Coliforms Coliforms are bacteria that live in the intestines of humans and animals and in the soil. They are used as indicators of the possible presence of harmful bacteria. A total coliforms count of less than or equal to 10 indicates satisfactory drinking water. A total coliform count greater than 10 is a strong indication that disease-causing microorganisms may be present in your water supply. You should not drink the water until it is properly treated.

Escherichia coli E.coli are coliforms that live only in the intestines of humans and animals. They are great indicators of the possible presence of harmful bacteria. If any ***E. coli*** are found in your well water, you should not drink the water until it is properly treated.

Hardness Hardness in well water is due mainly to naturally occurring calcium and magnesium particles. Drinking hard water is not a health hazard. However, it will cause scaling (a buildup of minerals) on utilities and surfaces. Hard water is also very difficult to lather, causing overuse of soap and detergent.

Metals and Minerals Many different types of metals and minerals occur naturally in the environment, and others are derived from man-made sources. Some affect your water's safety, but some only affect the water's colour or smell. Refer to the ***Resources*** on p. 31 on how to find more information on contaminants. Some metals and minerals that may be found in your well water include:

- Lead
- Copper
- Arsenic
- Manganese
- Nitrates
- Chloride
- Iron
- Hydrogen Sulfide

Pesticides and Fertilizers Pesticides are man-made chemicals that are applied to the environment in an effort to control unwanted pests. Fertilizers are added to soil to enhance growth of plants. Well owners should refrain from using any chemicals in the vicinity of their well.

Gasoline, oil, diesel fuel and other solvents Storage tanks can leak fuel into your well, so be sure to look for signs of leakage. Solvents such as paint thinners and degreasers should never be used or stored around water wells. Drinking water contaminated with these chemicals is a health hazard.

Water *testing*

See the Resources section of this booklet for information about testing.

Test for *harmful* bacteria

Bacterial contamination is the most common type of well water contamination. It is recommended that you test your well water regularly for bacteria, including total coliforms and ***E.coli***. Contact your local Government Services Centre for information on free bacteria testing. Always carefully follow the instructions included with the water sample bottle to ensure accurate results.

Testing at least twice a year for bacteria is recommended by the DOEC. If you have a shallow well, more frequent testing is suggested.

Early spring is a good time to test your well water for bacteria. Another good time is the day after a heavy rainfall. Melting snow and running water can carry surface contaminants into your well. If your well water is safe under these conditions, it is more likely to be safe the rest of the year.

Test regularly even if your water seems fine, because you can't taste, smell or see bacteria and most other contaminants. Don't rely on your neighbour's test results – wells that are only a few steps apart usually have different water quality.

Besides routine testing, you should also test:

- after major plumbing work, well repairs or major land use changes in your area.
- if you detect changes in water quality, including taste, odour, and appearance
- if regular well users experience unexplained health problems that may be water-related
- after flooding. (If flooding is common in your area you may want to retrofit your well. Contact a DOEC licensed well driller.)
- after lengthy periods of non-use

Testing for Other Contaminants

Drinking water can also be tested for other harmful contaminants such as those mentioned in the ***Possible Contaminants*** section. Anyone drinking well water should consider testing for metals and minerals ***every two years***. Your well water quality may be impaired by naturally occurring metals and minerals, or by human activities such as landfills, road salting, septic systems and construction.

Test your well water for metals and minerals every two years to ensure your water is not a threat to you or your family.

Here are some suggested times to test for certain contaminants:

Test for:	If you had, or detect:
• Gasoline	• Fuel spill, fuel odors or a thin film of oil in your water.
• Pesticides	• Past or present use of these substances near your well, • Pesticide spill or leak, or • Issues about possible backflow through your plumbing into your well during mixing of pesticides and other chemicals.
•Solvents	• Chemical spill in the vicinity of your well, or • Strong chemical odor in your well water

If at any time you think there may be a problem with your well water, you should test it.

An accredited laboratory can test your well water for chemical parameters for a fee. Contact your local Government Service Centre, or search for "water testing" in the government blue pages of your phonebook for more information.

Bacterial contamination

If you get a serious adverse bacterial test result – or have any reason to believe your water is dangerously contaminated – take immediate action.

Use bottled water or eliminate harmful bacterial contaminants by sterilizing your water.

Use one, not both, of the following sterilization methods to eliminate bacterial contaminants:

Bring water to a rolling boil and then boil it for at least one full minute. (A rolling boil is a vigorous boil that cannot be stopped by stirring the water.) Note that although boiling is an effective method of eliminating bacterial contamination it may actually concentrate other types of contamination such as chemicals, metals, and minerals.

– or –

Mix at least 2 drops of liquid household chlorine bleach to each litre of water. If water is cloudy, use 4 drops per litre of water. Let stand for 30 minutes. There should be a faint chlorine smell to the water. Use fresh unscented chlorine containing 5.25 per cent sodium hypochlorite.

Refrigerate boiled or treated water in clean food-grade containers.

Bottled or sterilized water is safe for drinking. It is also recommended for food washing and preparation, brushing teeth, bathing children, and washing dishes.

Shocking should not be used routinely or repeatedly. It is not a substitute for eliminating an ongoing source of contamination or a defect in your well.

Well *disinfection*

Shocking is a temporary method of disinfection used to eliminate a one-time case of bacterial contamination.

Shocking your well is a relatively complicated exercise that requires care and skill. You may want to engage professional assistance. Public health offices are a source of detailed instructions. While shocking may provide a temporary solution, it may be more effective to boil the water you drink.

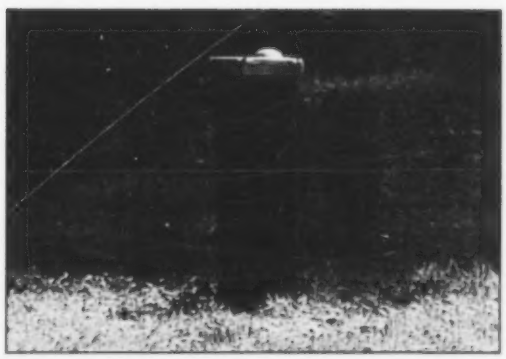
To properly shock your well, ensure you get detailed instructions from a licensed well driller or a Public Health Office. Information you will need to know include:

Exercise care in shocking your well.

- the correct amount of bleach to use in your well – using too much or too little can cause problems. See Newfoundland and Labrador Government guidelines for disinfecting dug and drilled wells.
- how to remove all filters.
- how to shut down your entire water distribution system to give your entire well water system at least 12 hours, and no more than 24 hours, contact time with the chlorine.

Ensure chlorinated water is properly and safely drained from the system - not into the septic system!

Well water should not be consumed until you have at least three bacteria-free tests conducted at least one week apart.



Eliminate the cause

If you have contaminated water, begin by considering the possible sources of contamination. Reducing or eliminating contaminants at the source is the best place to start.

Next, take a closer look at your well. If your well water continually exceeds drinking water standards for bacteria, there is likely an ongoing source of bacteria affecting your well. Are there defects in the location, construction, or maintenance of your well that could account for the contamination? See the previous sections of this booklet. Address any problems you identify.

If you can't detect the cause of the problem, bring in a DOEC-licensed well driller right away.

You may be able to save yourself a lot of money by hiring an DOEC-licensed well driller to solve the problem instead of buying a home water treatment device. Treatment can be beneficial – it may even be necessary in some circumstances. But treatment should be the final option, after taking steps to reduce contaminants and improve your well.

Treatment *systems*

Treatment systems should be selected to address your specific needs. Consult a professional when installing a water treatment system.

For bacteria

If your water is contaminated, it is better to remove the source of the contamination than to treat the water. However, if the problem cannot be solved at the source, a number of water disinfection systems are available. Each system requires routine maintenance. Refer to the owner's manual. Regular testing of your water must continue.

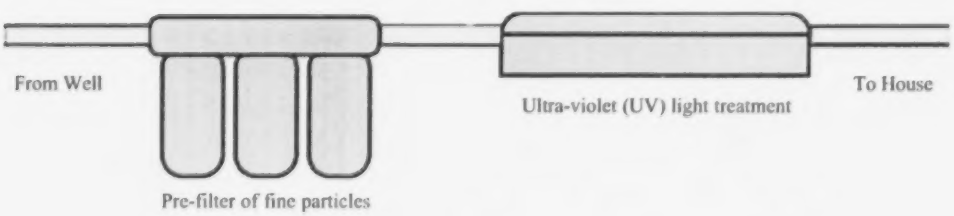
Chlorinators continuously add chlorine to your water distribution system, allowing sufficient contact time for the chlorine to kill the bacteria. These units must be checked often to ensure that the right amount of chlorine is being added.

Ultra-violet (UV) light filters use UV light to kill bacteria, viruses, and intestinal protozoa in pre-filtered water. A Class A system is required (NSF 55). Pre-filtration of water is generally required for this treatment to work properly. The light needs to be replaced regularly. Drinking water needs to be refrigerated after treatment.

Distillers boil water, then condense the vapour and collect it in another compartment. Bacteria and minerals are removed, and some chemicals. Water should be filtered before treatment and refrigerated afterwards. Standard is NSF 62.

Ozonators inject small amounts of ozone gas into water to kill most bacteria. Treated drinking water should be refrigerated.

Household Water Treatment System
Ultra-Violet (UV) Light System



For other contaminants

> WARNING: the following treatment systems
> do not kill bacteria.

Reverse osmosis removes some chemicals – but not bacteria – by passing pre-filtered water through a membrane. This process, which removes inorganic chemicals such as chloride and nitrate, is often used in combination with carbon filters. Reverse osmosis wastes large amounts of water, which could be a concern if water supplies are limited or the septic tank is over-burdened. An option is to use Reverse Osmosis only for drinking water. The standard is NSF 58, but it may be certified under NSF 42 or 53.

Activated carbon filters (pitcher style, tap-mounted, or under-sink) can improve taste and odour and remove organic chemicals. Standard is NSF 42. Larger systems, often used as a pre-treatment for reverse osmosis and water softening systems, remove volatile organic compounds. Standard is NSF 53.

> WARNING: bacteria can be trapped and multiply in
> a carbon filter. Regular maintenance is required.

Ion exchange water softeners should remove calcium and magnesium "hardness", thus reducing the scaling tendency. Standard is NSF 44. Common domestic water softeners increase the level of sodium in drinking water. Individuals on salt-reduced diets should consult their physician if sodium levels in their drinking water exceed 20 mg/litre.

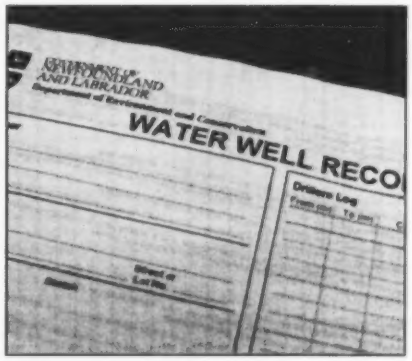
Hiring a well driller

Always hire a DOEC-licensed driller

As set out in the Water Resources Act, a licensed well driller must be trained and certified according to standards set by the Well Drilling Regulations. A list of well drilling companies is available through the Newfoundland and Labrador Government website at: www.gov.nl.ca/Env/env/waterres/Groundwater/ground_water.asp

Some tips:

- Ask to see the license. Confirm that the license is up to date with the DOEC.
- Get more than one licensed driller to provide you with advice, a detailed written description of the proposed work (e.g., expected well depth, unit rates, extra services), and an estimate of the total cost.
- Get references and review past work before making a final decision. Ask the licensed drillers the expectations of water quality and quantity in your area and confirm this with your neighbours.
- Get a signed agreement in writing if there are any changes in the work and cost.
- Pay promptly when the work is completed as described in the agreement.
- Contact the DOEC if you have any questions or concerns about the qualifications or work procedures of drillers.
- Keep all documents relating to your well, pump, pumping test, and maintenance.
- Many licensed water well drillers will provide a yearly service check for a fee.



Your *water well* records

A well driller must provide you with a copy of a water well record. Each well must have its own well record. Contents include well depth, casing length, water yield test results, a geological log that describes the soil and/or bedrock conditions, well location with GPS coordinates, water type encountered, drilling method, pump recommendations and more.

The well record should be updated when the depth of the well is changed or the well is upgraded or plugged and sealed.

If you don't have a record for your existing well, you can order them from the DOEC. Well records are entered under the name of the original well owner.

Keep your well records in a safe place, in a file with all papers relating to the well. Make copies to give to drillers. Keep them with test results, invoices and descriptions of work completed, filter and treatment system manuals, service records, and reference materials like this booklet.

Records should be provided to new owners on sale of the property.

Resources

Conservation Corps Newfoundland and Labrador.See: www.conservationcorps.nf.ca. This website includes materials and links relating to well water, water conservation and other Conservation Corps' programs. Or email: contactus@conservationcorps.nf.ca

Green Communities Canada. A national umbrella group for community nonprofit organizations that deliver environmental programs and services. See: www.gca.ca. Contact: (705) 745-7479 or fax (705) 745-7294; email info@greencommunitiescanada.org for general inquires.

Government of Newfoundland and Labrador, Department of Environment and Conservation. See: www.env.gov.nl.ca/env for acts, regulations and resources relating to water.

Government of Newfoundland and Labrador, Department of Health and Community Services. See: www.health.gov.nl.ca/health/publications/ehp/drinking_water_awareness.htm for information about safe drinking water.

Newfoundland and Labrador Water Well Association. DOEC licensed well drillers association. Contact: 1-877-312-7870 or Fax: (709) 955-3402.

Resources continued

Environment Canada. Fact sheets and other resources on freshwater conservation and safety and use. See: www.ec.gc.ca/water.

Government of Newfoundland and Labrador, Department of Government Services. Information on testing, septic systems and other related topics. See: http://www.gs.gov.nl.ca/gs/gsc/locations.stm

Canadian Water Quality Guidelines. Information on water quality and safety, including links to water quality guidelines for recreational, drinking and other purposes. See:http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index_e.html

Well Aware: A Well Owner's Video. A companion to the Well Aware booklet published in Ontario, Canada (2003) featuring CBC science journalist Bob McDonald. The video can be ordered from the Ontario Ground Water Association website See: www.ogwa.ca

Well Records: Well Records are available from the provincial Department of Environment and Conservation. See previously listed contact information.

Water Testing: Contact your Public Health Department or Government Services Department for further information on well water testing in your area. Try the blue pages in your local telephone book for contact information.

Water Treatment Devices. Check you local yellow pages for listings of companies that sell water treatment devices. Search for: ***water treatment, water purification equipment, water filtration equipment.***

Septic Systems. ***Private Sewage Disposal and Water Supply Standards.*** Contact the Government Service Centre office nearest you to obtain a copy of this booklet.

Water quality testing diary

Date Tested:	Parameters:	Result:
2002-08-04 Sample	minerals / metals / etc	normal

Well maintenance diary

Date Completed:	Action:
2002-08-04 Sample	extended casing above ground, landscaped around